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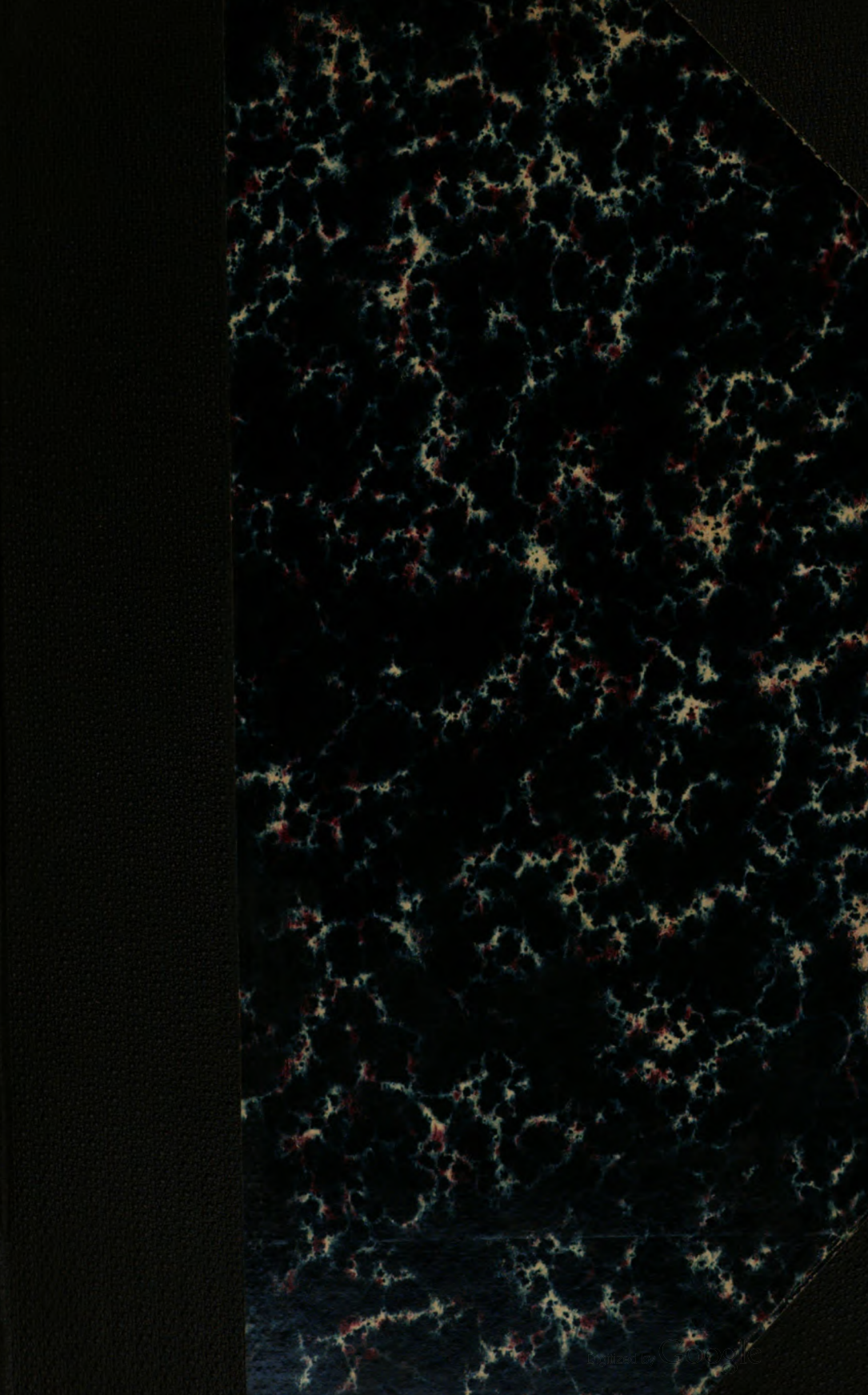
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W. G. FARLOW



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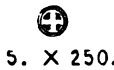
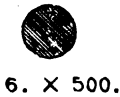
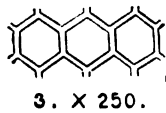
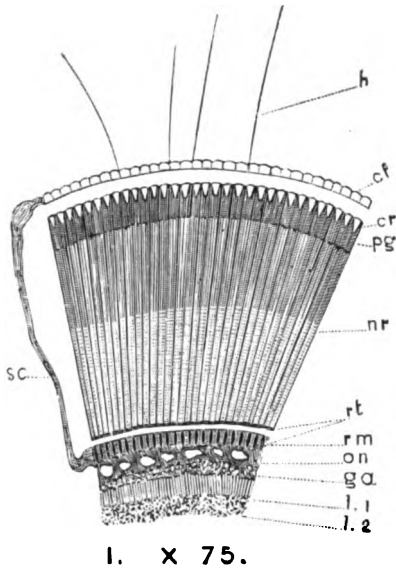
No. 2.

THE LARVA OF THE CHRYSOPA.

BY F. W. LEGGETT.

(Read January 21st, 1887.)

Of the Chrysopa (Lace-wing Fly), of which the two specimens I exhibit are the larva, Packard says "the body is slender, with delicate gauze-like wings, and it is generally green with golden eyes. When disturbed it emits a foetid odor, its eggs supported by long pedicels, are often laid in a group of aphides or on plants infested by them. When hatched the voracious larva finds its food ready at hand, and destroys immense numbers of plant-lice, whence its name "Aphis Lion." It turns to a pupa late in summer, and thus passes the winter within a very dense round whitish cocoon, situated in the crevice of bark. In Europe, gardeners search for these Aphis Lions, and place them on fruit trees overrun with lice, which they soon depopulate." There are two peculiarities about this insect which I do not find noted in authorities consulted. First, retained powers of locomotion while in their white cocoon-like covering, for the pair I have here this evening fell on my hand when riding, and would have been brushed off as a particle of floating wool had I not noticed that they were moving rapidly away. Secondly, they have four distinct mandibles, two on either side of the head, those on the same side being flat on the inner and rounded on the outer surface, fitting so closely and accurately together, that when not in use and crossed, as they appear under one of the microscopes, the dividing line is not perceptible. These mandibles are formidable weapons, being about one-quarter the length of the body. I have read somewhere, but am unable to find it, that this white



J. L. Z. Del. ad Nat. et Sc.

THE COMPOUND EYE OF VANESSA IO, L.

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No. 3.

THE COMPOUND EYE OF VANESSA IO, L.

BY LUDWIG RIEDERER.

(*Given May 6th, 1887.*)

In making a full series of continuous sections through the head of an insect with compound eyes, a lepidopter for instance, if we begin in a plane adjacent to and parallel with the front, the first sections of either of the compound eyes will be tangential to the globular mass of the combination. As the cutting approaches the centre of the combination, the sections will eventually lie in the plane of some of the "ommatidia," which all diverge somewhat in the manner of the radii of a sphere, and these may be called radial sections. The term ommatidium, or little eye, is the name given to each entire slender column, with its component parts of lenses, pigment, nerve-fibres, and layers, which parts render it in reality a distinct organ of vision. The multitudes of these ommatidia, standing side by side, in some instances amounting to many thousands, combine to form the globular mass of the compound eye.

Explanation of Plate 3.

- FIG. 1.—Portion of a radial section of the compound eye of *Vanessa Io*, L.: *h*, hairs upon the cornea; *cf*, cornea-facets; *cr*, crystalline cones; *pg*, pigment-layer; *nr*, nerve-rods; *rt*, separated layers of the retina; *sc*, sclera; *rm*, enlarged ends of the rhabdoms in pigment; *on*, fibres of the optic nerve; *ga*, ganglion-cells; 1, 1, 1, 2, layers of brain, or optic nerve.
- FIG. 2.—Three ommatidia, with the nerve-rods and crystalline cones slightly separated, the various portions being indicated by the same lettering as that of Fig. 1.
- FIG. 3.—The exterior surface of three cornea-facets.
- FIG. 4.—A longitudinal section of a crystalline cone.
- FIG. 5.—A transverse section of a crystalline cone.
- FIG. 6.—A transverse section through the central portion of a nerve-rod, with the central rhabdom, surrounded by six retinulae.

The tangential sections will show the ommatidia, as these might be seen, by looking directly into the compound eye from its outer surface, and consequently, and as a general rule, especially in the central region of each slice, they will give more or less exact transverse sections of these ommatidia.

The radial sections, on the other hand, because they lie in the planes of the above-mentioned radii, and cut them longitudinally, will show the various portions of the ommatidia in their natural superimposed connection.

The outer surface of the compound eye is formed by a skin of chitine, which may be easily peeled off in continuity, and which is as transparent as glass. This surface is divided into a great number of small areas—"cornea-facets,"—each one of which is the distal end of an ommatidium, and is itself outwardly convex. These facets have their junctures strengthened by a rim of chitine, and their contour is that of a more or less regular hexagon, with rounded corners. But this contour is not nearly so constant and regular, over the whole compound eye, as it was usually thought to be. At the juncture of three or four facets the rim often supports stiff hairs or bristles.

From the periphery of the transparent cornea the chitine skin lined within by a pigmented layer, resembling a chorioid coat, encloses the whole remaining globular mass of the compound eye, embedded in the head, and appears to correspond with the sclæra, or sclerotic of the ball of the eye of vertebrates.

Next below the cornea follow in a layer the lenses, or "crystalline cones" of the ommatidia. These cones are embedded in pigmentous cells, which separate them respectively from their neighbors. The evolution of these crystalline cones from four cells is readily to be understood. We see in their transverse section four nuclei, with distinct septa in the form of a cross.

Below the crystalline cones lies a thick layer, comprising the greater part of the bulk of the globular mass, and consisting of the "nerve-rods." These nerve-rods occupy the greater portion of the length of the ommatidia, and are respectively composed of a central fibre, which has been named the "rhabdom," surrounded by five to seven other delicate fibres, which are the *retinulæ*.

The rhabdom is of extreme tenuity in proportion to its length. It extends through the entire nerve-rod, from the crystalline

cone inwardly, until it ends in a spindle-shaped enlargement, embedded in the pigmented retina. In this enlarged end the rhabdom shows its nucleus.

Close to the retina follows the above-mentioned sclæra, or capsule of the whole compound eye, through which pass the fibres of the optic nerve in bundles. Here the fibres cross each other, and develop into a distinct layer, containing many ganglion-cells. They then pass into another more striped layer, forming the ganglion of the eye, and so finally over into the brain.

Tracheæ, dissolved into the finest bundles of tubes, surround the ommatidia, passing up inside of the sclæra.

POLYPORUS SANGUINEUS.

BY P. H. DUDLEY, C. E.

(Presented in connection with the specimen from Panama, exhibited by him, March 18th, 1887.)

This beautiful Polyporus, of cream colored cup, occasionally tinged with pink, and having scarlet pores underneath, attracts attention by its varied and brilliant colors. I have only seen it growing, upon the Isthmus, first, upon Cyprus ties, from Florida, where it is said to be common; second, upon the sap-wood of the Lignum-vitæ ties, in the tracks of the Panama railroad. The fact of finding it growing upon these two kinds of woods was surprising and interesting; for the structure and cell-contents of these two woods are so dissimilar, that I did not expect to find the same species of fungus growing upon both woods. It shows that the mycelium of the fungus is able to sufficiently disorganize each of the woods, as specified, for the growth of its fruit. I found more specimens on the Cyprus, than on the Lignum-vitæ ties, probably because the latter are so durable, as the heart-wood lasts from twenty to twenty-five years in the track; while the Cyprus only lasts from two to three years. Lignum-vitæ is the only wood, in its natural state, when used for ties, that is able to resist decay for any length of time on the Isthmus. Many of the native woods decay in less than a year.

Near the Atlantic coast but one specimen of *Polyporus sanguineus* was found, and this was upon a Cyprus tie, in the Aspin-wall freight-yard. *Trametes pini*, Fr. and *Lenzites abietina*, Fr.

were abundant upon other Cyprus ties in this yard. This wood is not used for ties in the main line of the Panama railroad. Lignum-vitæ ties, near the Atlantic coast, had been in service many years ; yet only a little fungus was found upon them.

A few specimens of *Lenzites striata*, as identified by Prof. Charles H. Peck, were obtained. At Bujio Quarry, sixteen miles inland, this latter fungus was very abundant on the sap-wood of the Lignum-vitæ ties. At Frijoles, three miles further inland, I found the same fungus, and also *Polyporus sanguineus*, on Lignum-vitæ ties, in a recently constructed switch-track. In many cases, both species were found upon opposite sides of the same tie. The *Lenzites striata* was dry and firm, and had evidently ceased growing, shortly after the beginning of the dry season. *Polyporus sanguineus*, on the contrary, was fresh and growing. At Paraiso, on the Pacific slope, this fungus was found, in conjunction with *Lenzites abietina*, Fr., on Cyprus ties, in the temporary track of the Panama Canal, and also on ties piled three and four feet high.

These specimens of fungi were collected in January and February, of the present year, during what is called there, "the dry season," which commences in December, and lasts until April or May. The remaining months are called "the wet season ;" the rain-fall on the Atlantic coast being from ten to twelve feet per annum, which decreases to one-half this amount on the Pacific coast. The mean annual temperature of about 80° Fahr., and the humidity of the air, form the most favorable conditions for the growth of fungi, and consequent rapid decay of woods, on the Isthmus of Panama.

CHAMÆCYPARIS SPHÆROIDEA, SPACH ; WHITE
CEDAR. AND ITS FUNGUS, AGARICUS CAM-
PANELLA, BATSCH.

BY P. H. DUDLEY.

(Read January 7th, 1887.)

This is the White Cedar of the Atlantic coast, which grows in dense masses in cold, deep swamps, "from Southern Maine to Northern Florida, and along the Gulf coast to the valley of the

Pearl river, Mississippi." According to Prof. C. S. Sargent, in Tenth Census Report.

In many respects it is an exceptional tree, and one of great economical value, growing from seventy to ninety feet in height, and two to four feet in diameter; the latter is not common.

In the North especially it is a slow grower, the annular layers being narrow, from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch in thickness, and as seen in the photomicrograph, Fig. I., the tracheids are small, thin walled. the wood being classed as soft and fine grained.

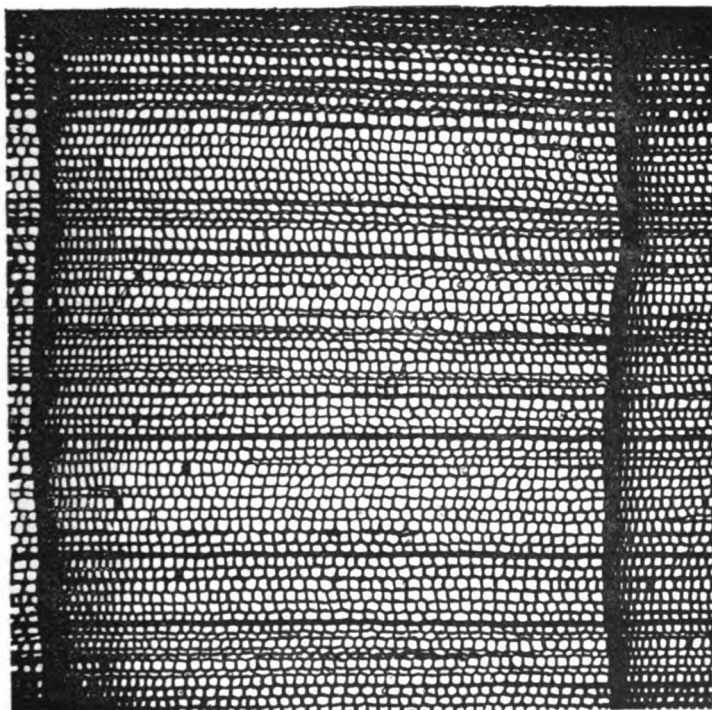


FIG. I. WHITE CEDAR. TRANSVERSE SECTION MAGNIFIED 50 DIAMETERS.

Its specific gravity ranges from 0.29 to 0.45, the latter being uncommon, 0.30 to 0.35 being the general range of the wood from the North. It is one of the group of the light coniferous woods. *Sequoia gigantea*, Decsn, Big Tree, *Thuja occidentalis*, Arbor vitæ, are as a rule 0.01 or 0.02 lower in specific gravity.

The durability of White Cedar in situations where it is alternately wet and dry or in contact with the ground, is in strong contrast to many other woods of much harder and firmer texture, and for this reason it is so largely used in ship building, for telegraph poles, fence posts and railway ties. The decay of this wood is so slow that when used for railway ties, the rails crush the fibres under them before the ties decay in the ballast, and are removed more on account of mechanical destruction than decay—as a rule.

The photomicrograph of the transverse section, Fig. I., indicates at once, by the nearly uniform thickness of the cell walls for the entire annular layer, that it is not a strong wood, as only a few rows of cells in the last of the season's growth are tabular and thickened, this is in strong contrast to the number of rows in a layer of Yellow Pine, *Pinus palustris* (Mill).

The tracheids in White Cedar are comparatively small in diameter, only ranging from 0.0013 to 0.0015 of an inch, while the lumen is from 0.0011 to 0.0013 of an inch, showing that the walls are very thin, which fact to a great extent accounts for the low specific gravity and softness of the wood.

Another feature to be noticed in Fig. I. is the comparatively small number of bands of medullary rays, showing as dark lines, crossing the (Fig.) page. The bands are only of single width of cells, and the latter so small that the lumen does not show in a magnification of 50 diameters. In a tangential section the bands are seen to be composed of only 2, 3, 4, 6 or 8 superimposed cells, the first three predominating. In a square inch of wood only about 400 of these bands occur, a comparatively small number, and these do not furnish much resistance to indentation, but are very effectual in checking the tendency of decay, from spreading laterally.

Another feature shown by the transverse section is the absence of resin ducts, common to many of the other coniferous woods. Much of the resin is confined to special resin cells, the ends of which appear as dark cells in the photomicrograph. This feature is common to the most durable of the coniferous woods. The medullary rays of the duramen especially, also contain deposits of resinous matter, which in most cases remains intact after the surrounding tissue is well advanced in decay.

Beside the visible resinous matter in the cells mentioned, tests indicate that in the duramen there is resinous matter on and in the walls of the ordinary tracheids. They do not absorb or imbibe water readily or in sufficient quantities to cause the wood to become "water-logged" after being submerged many years.

The delicate middle lamellæ can be traced in the lenticular markings so there is not a free and unbroken communication between the tracheids, water being prevented from passing freely from cell to cell.

The thinness of the cell walls in this wood gives a greater percentage of weight, of the middle lamellæ, to the whole weight than in some other woods, and this may help account for a portion of its non-absorbing properties.

The physical properties of the tracheids as regards strength are not proportionally as great according to their specific gravity as those of many others of the coniferous woods, it having but few of the fibres per layer which contribute most of the strength and elasticity to a wood.

This is well shown in the following table :—

Name of wood.	Specific gravity.	Crushing strength in pounds per sq. inch.	Ratio.
White Cedar,	0.3429.	3697.	10781.
Yellow Pine,	0.7229.	9081.	12564.
Hemlock,	0.4240.	5549.	13086.
Tamarack,	0.6197.	8297.	13888.
<i>Larix occidentalis</i> ,	0.6420.	9991.	15563.

The data were compiled from a series of tests upon woods made upon the U. S. Testing Machine at the Watertown Arsenal. The specific gravities and crushing strengths are the average of 4 to 8 specimens of each wood.

The ratio means the number of pounds per square inch required to crush the wood; provided the specific gravity was 1. The specific gravity of pure cellulose has not been determined, but is estimated to be from 1.25 to 1.45. The relatively low crushing resistance of the white cedar, according to its specific gravity, is very marked, in comparison with the other woods given in the table, and has given rise to the hypothesis, that there is a difference in the chemical composition between the thick and the thin walled tracheids. I had a series of chemical analyses made to determine the matter if possible. A slight differ-

ence was found, but neither series gave satisfactory formulas for cellulose, so the matter is still unsettled.

Under the microscope, it seems to be the second lamellæ of the tracheid, which is principally increased, in the thick walled tracheids; and woods which do not have a portion of the annular layer composed of the thick walled tracheids, do not have as high specific gravity, or as much strength.

THE FUNGUS AGARICUS CAMPANELLA, BATSCH.

Pileus only three-eighths to one-half inch broad. The mycelium is composed of very coarse dark threads. The numerous decayed spots, from one-fourth to one inch in diameter extending longitudinally in the wood, found in many of the railroad ties cut from live White Cedar trees, are exceptional, rarely being found in other woods. How the decayed spots are started and checked, for the time being, forms one of the many interesting questions in the decay of woods.

The young tree sends out an abundance of limbs near the base and as the tree increases in height, the lower limbs become shaded then die, and being so durable, do not quickly break off close to the body of the tree, the latter soon forming a layer of wood over the wound. The moisture which collects at the junction of the limb and tree, germinates the spores of its special fungus, and starts the growth of a mycelium inducing a decay in the upright cells, spreading laterally but little. This continues until the growing wood closes up the orifice, by shutting off the air supply, and further decay is arrested.

In case the sapwood does not close the orifice, the decay continues, the result being a hollow tree.

PROCEEDINGS.

MEETING OF MAY 6TH, 1887.

The President, the Rev. J. L. Zabriskie, in the chair.

Twenty-five persons present.

The Corresponding Secretary read a letter from Dr. Henri Van Heurck, of Antwerp, Belgium, expressing thanks for his election to Honorary Membership in this Society.

The Corresponding Secretary also acknowledged the receipt of copies of Dr. Van Heurck's Communications to Scientific Societies at Antwerp.

The Librarian, Mr. A. Woodward, read a letter from Mr. G. S. Woolman, who presented to the Society a copy of the new work by Dr. Alfred C. Stokes, entitled, "Microscopy for Beginners."

Mr. A. Woodward also read a Paper, entitled, "The Foraminiferal Fauna of the Miocene Bed at Petersburg, Va.," which Paper is published in this volume of this Journal, at page 16.

PROGRAMME OF OBJECTS ANNOUNCED FOR EXHIBITION.

1. *Meyenia fluviatilis*, var. *asperrima*, Dawson, from Calumet River: exhibited and described by A. WOODWARD.

Fresh-water sponge. Spicules birotulate, that is, consisting of two wheels or disks, connected at their centres by a short shaft, or they may be flat or umbonate disks.

"The first sponge found in Niagara River by Prof. Kellicott, belongs to this genus. Mr. G. M. Dawson had found the same species in Canada, and named it *Spongilla asperrima*, but according to our present classification it must be *Meyenia asperrima*. It differs very slightly, if at all, from *Meyenia fluviatilis*."

2. *Spongilla fragilis*, Central Park, New York City. A dried specimen: exhibited and explained by A. WOODWARD.

3. Specimens of *Amphistegina lessonii*, d'Orb., from Petersburg, Va. Also others from Nussdorf, near Vienna, Austria: exhibited and explained by A. WOODWARD.

4. *Laminaria longicuris*, Dela, Portland Harbor, Me. Broken up and distributed to the members: exhibited and explained by A. WOODWARD.

5. Section of Concord Granite (under the Polariscope): exhibited by T. B. BRIGGS.

6. Bryozoa: exhibited and described by W. E. DAMON.

This specimen shows the delicate lace-like structure of the corallaceous deposit of this compound polyp animal; formed on the inside of the neck of a bottle—hence the honey-comb like cells have been well protected, and are very perfect.

7. Eggs of Bot-Fly (*Gasterophilus equi*) on horse hairs, with the larvæ emerging: exhibited by CHAS. S. SHULTZ.

The larvæ of this species live in the intestines of horses, producing the disease called Bots (Harris).

The female fly has a long and flexible *ovipositor*, with which she deposits her eggs upon the hairs of the fore legs of the horse, while sustaining herself in the air by reduced motion of the wings. The eggs are covered with glutinous matter causing them to adhere to the hairs, and few are deposited out of the reach of the mouth of the horse.

8. Head of the Mosquito, with lancets. Showing five minute stings (?), two of them barbed : exhibited by CHAS. S. SHULTZ.

9. Snail's Eggs. Young snail, within egg ; polarized : exhibited and explained by F. W. DEVOE.

10. Egg shells of the *Vanessa Antiopa*, Linn. : exhibited by E. B. GROVE.

The Eggs of the *Vanessa* differ from those of other Lepidopterous insects, in having a much harder shell.

MEETING OF MAY 20TH, 1887.

The President, the Rev. J. L. Zabriskie, in the chair.

Seventeen persons present.

The President announced the receipt of various Publications, in exchange for the Journal of the Society.

Messrs. James Walker and T. B. Briggs were elected Resident Members of the Society.

The President presented to the Cabinet of the Society the slide exhibited by him, displaying the three main sections—transverse, radial and tangential—of the wood of the Black Mangrove.

PROGRAMME OF OBJECTS ANNOUNCED FOR EXHIBITION.

1. Quill of Canada Porcupine (*Erethizon dorsatus*) : exhibited and described by B. BRAMAN.

"The quills of the Canada Porcupine are from one inch to three inches long. They are loosely attached to the skin, and are barbed at the point. They easily penetrate the flesh of the animal which attacks it, strongly retain their hold, and tend continually to become more deeply inserted."

2. Consecutive Sections through Head of *Salamandra maculosa* (larva) : exhibited and described by L. RIEDERER.

The eye shows all the constituent parts as : cornea, iris, lens, sclerotic, choroid, vitreous humor, retina, nerve granules and fibers, rods and cones, and entrance of optic nerve (blind spot).

3. Black Mangrove (*Avicennia nitida*, Jacq.), transverse section of wood of : exhibited and described by J. L. ZABRISKIE.

This tree is a native of the West Indies, and also of the Florida coast. The wood is heavy, hard, coarse-grained, and of dark brown color. The transverse section shows the very eccentric manner of growth of the annual rings, the irregular position of the large ducts, and the abundance of resinous material.

4. Head of a Bishop's Mitre, one of the *Asopidae* : exhibited and described by F. W. LEGGETT.

This relative of the "Cimex" is a great nuisance to fruit growers, not only sucking the juice of fruit, but rendering it unpalatable because of a fluid possessing an abominable smell, which exudes from two little pores between the hind feet. The compound eyes, the two red ocelli, the antennæ and the rostrum, within which are the toothed lances, can be plainly seen.

OBJECTS FROM THE SOCIETY'S CABINET.

5. Trans. sec. of the False Truffle (*Melanogaster ambiguus*, Tul.), showing the spores in situ ; collected at Poughkeepsie, N. Y. and prepared by W. R. GERARD ; $\times 250$.

This fungus (see Species No. 1,048, Cooke's Hand-Book Brit. Fung.) is subterraneous, but it is more closely related to the Puff-Balls than to the genuine Truffle. Species of the latter have their spores situated in sacks, while *Melanogaster* has the spores diffused in patches throughout the pulpy, dark, globose *hymenium*. And this species is distinguished by its large, ovate, papillate spores, "and its abominable smell, which resembles that of assafœtida. A single specimen in a room is so strong as to make it scarcely inhabitable."

6. Scale of Common Sun-fish (*Lepomis gibbosus*) ; by polarized light ; $\times 30$.

This scale strikingly exhibits the characteristics of the Perch family ; the rows of sharp, alternating spines, projecting from the posterior free margin, and the prominent radiating rows of transverse ridges, extending to the anterior margin, which is imbedded in the skin.

7. Hairs of Edelweiss : the famous Alpine plant, nearly exterminated for the gratification of tourists.

8. *Polycystina* from Barbadoes ; $\times 30$; very neatly arranged in a symmetrical pattern.

MEETING OF JUNE 3d, 1887. -

The President, the Rev. J. L. Zabriskie, in the chair,
Twenty-four persons present.

In the absence of the Recording Secretary, Mr. Geo. E. Ashby was appointed Secretary *pro tem*.

The Corresponding Secretary read a communication from the Royal Danish Academy of Sciences, at Copenhagen, expressing thanks for the presentation of copies of the Journal of this Society.

Mr. Wilson Macdonald was elected a Resident Member of the Society.

Mr. L. Riederer read a Paper, in continuation of his remarks at the last meeting, on the Head of *Salamandra maculosa*, illustrated by a large and finely executed diagram, and by many excellent consecutive sections under the microscope, as set forth in the exhibits of this meeting.

Mr. F. W. Leggett read a Paper describing his exhibit, referring especially to the ability of the Roach to walk, when inverted, and suspended on the under surface of a horizontal sheet of glass.

He arrived at the conclusion that the tarsal joints were cup-shaped, and of peculiar construction, and that the insect attached its feet by suction.

OBJECTS EXHIBITED.

1. *Salamandra maculosa* ; sections through the head ; showing constituents of tissues of skin, skull with brain, the eyes, the ciliated membranes in cavity of mouth, the tongue, ducts to gills, &c.

2. Pulvillus and unguis of Roach. (*Blatta*) : by F. W. LEGGETT.

3. Pulvilli on tarsal joints of Roach (*Blatta*) : by F. W. LEGGETT.

4. Sections of Felspar, perpendicular to, and parallel with the lines of cleavage : by T. B. BRIGGS.

5. Wood of the Maple (*Acer*), with the structure much broken down by decay, but beautifully showing the plates of the medullary rays, and certain of the hard longitudinal cells ; by reflected light : by M. M. LE BRUN.

OBJECTS FROM THE SOCIETY'S CABINET.

6. Pyrite, showing free Gold, Grass Valley, California.

7. Diatoms, from Santa Monica, California.

8. *Isthmia nervosa*, on Algae, Monterey, California.

9. Spicules of Sponge, from California.

10. Sherzolite, from the French Pyrenees.

11. Volcanic Glass, from the Sandwich Islands.

12. Quartz, from inclosure in Muscovite, Grafton, N. H.

13. Quartzite, from the Black Hills.

Mr. C. E. Hanaman, F. R. M. S., Curator of the American Postal Microscopical Club, being present as a visitor, on request, addressed the Society, giving information concerning the operations of the Club.

MEETING OF JUNE 17TH, 1887.

The President, the Rev. J. L. Zabriskie, in the chair.

Twenty persons present.

Mr. C. S. Shultz remarked upon the Stage Micrometer exhibited by him, and ruled by Prof. Wm. A. Rogers, dwelling particularly upon the numerous difficulties met in operations of this kind.

Mr. P. H. Dudley followed with further particulars respecting the Dividing Engine employed by Prof. Rogers, and the mode of correcting errors in its practical working : also respecting the comparative advantages and disadvantages of rulings on glass and metal. In explanation of his own exhibit—the Fasoldt Eye-piece Micrometer—he said, that the lines were exceedingly delicate, and spaced at a distance of 500 to the inch.

Mr. E. B. Grove, in connection with the exhibit by Mr. F. W. Leggett, maintained, regarding the motion of the ovipositor of the Saw-flies, that their action was not direct, but with a twisting

thrust, and that these cutting instruments might be more appropriately termed rasps than saws.

Mr. C. S. Shultz presented to the Cabinet of the Society two slides of Diatoms, prepared by Miss M. A. Booth.

This being the last meeting before the summer recess, the President wished for the members a pleasant vacation, and a safe return to the operations of the Society, and urged upon them the duty and advantage of the prompt commission to writing, and the preservation of some notes of their microscopical vacation experiences.

OBJECTS EXHIBITED.

1. Stage Micrometer—in squares—upon Speculum metal : exhibited by CHAS. S. SHULTZ.

This was ruled by Prof. Wm. A. Rogers, upon his dividing engine, in two sections ; in one the divisions are parts of an inch, in the other, parts of a millimeter. Much longer ruled micrometers on metal, of which the error of the ruling of each division has been fully investigated, are now used as the standards of measure for the accurate construction of tools and machine work.

These measures are placed upon instruments known as Comparators, each of which has two reading microscopes with eye-piece cobweb micrometers. The objectives are provided with a Tolles' vertical illuminator, so the divisions on the micrometer appear very black. The system is so practical that mechanics are able to work within an error of $\frac{1}{1000}$ of an inch.

2. *Triceratium Javanicum* : exhibited by CHAS. S. SHULTZ.

3. Section from Scalp of White Collared Monkey : exhibited by CHAS. S. SHULTZ.

4. Albany City Water : exhibited by P. H. DUDLEY.

5. Eye-piece micrometer, made by Mr. Chas. Fasoldt : exhibited by P. H. DUDLEY.

The lines are said to be ground in the glass, not ruled.

6. Spores of *Merulius lachrymans*, Fr., from Hartford, Ct. : exhibited by P. H. DUDLEY.

This fungus is the one which often causes the so-called " dry rot " of houses, especially those of pine wood. It is commonly in the form of a placenta, but also effuso-reflexed. The forms are from two inches to thirty in diameter. The hymenium is pulverulent, and throws off great numbers of spores—those thrown

off from one form, about 20 by 30 inches in area, from which these are part, were sufficient to give a decided ferruginous shade to 350 square feet of flooring.

7. Cuticle of *Cyperus umbellatus*: exhibited by M. M. LE BRUN.

8. Ovipositor of a Saw-fly: exhibited by F. W. LEGGETT.

9. Section of Limestone; polarized: exhibited by T. B. BRIGGS.

EXHIBITS FROM THE SOCIETY'S CABINET.

10. Section of Petiole and Leaf of the White Water Lily.

11. Section of Leopard Skin.

12. Scales of *Telea Polyphemus*.

13. *Zea Mays*: Portion of Leaf.

14. *Deutsia gracilis*: Portion of Leaf.

SAN FRANCISCO MICROSCOPICAL SOCIETY.

MEETING OF JUNE 22D, 1887.

The regular semi-monthly meeting of the San Francisco Microscopical Society was held last evening at its rooms, President Wickson occupying the chair.

Series 2 and 3 of Walker & Chase's "New and Rare Diatoms," consisting of photo-engravings of interesting forms, with descriptive text, were donated by Dr. H. H. Chase.

A communication was received from A. J. Doherty, of Manchester, England, the well-known preparer of microscopic objects, announcing his intention of visiting this city in a few months. Arrangements have been made with him for a series of demonstrations of the most approved methods used in the preparing and mounting of objects for the microscope, and from the admitted ability of the gentleman in this line his discourses cannot fail to be interesting and instructive. A series of slides mounted by him and comprising a wide range of subjects, were shown under a number of microscopes last evening by J. G. Clark, and the excellence of workmanship shown by these mounts, elicited the warmest commendation.

J. A. Sladky, of Berkeley, was duly elected a resident member.

The useful little device known as "Griffith's Focus Indicator," was shown by Mr. Riedy. Its object is to enable an approxi-

mate focus to be obtained almost instantly, and to prevent the accidental crushing of a slide or cover-glass by the objective, in focusing.

Mr. Norris announced that through the kindness of Mrs. Ashburner, he had come into the possession of a number of exquisite slides, mounted by the late Prof. Ashburner, and comprising a number of preparations of the celebrated "original Santa Monica" find. No better disposition could be made of these, Mr. Norris thought, than to distribute them among the members of the society, and this he proceeded to do. As appropriate mementoes of a departed friend, as evidences of his rare skill as a microscopist, and as the last remaining examples of mounts from the remarkable fragment whose history has been so closely connected with that of the society, these slides will be considered treasures by their fortunate possessors.

Specimens of rich diatomaceous earths from near San Pedro, and from near Santa Monica, collected by Mrs. Bush, of San José, were also handed in by Mr. Norris.

A. H. BRECKENFELD, *Recording Secretary.*

EDITORIAL.

Although not sufficiently acquainted with the difficult, and at present much examined and much disputed subject of the compound eye, to be able to endorse all the interpretations of Mr. Riederer, in his article in this number of this Journal, we nevertheless take great pleasure in stating that his sections of the compound eye of *Vanessa Io*—sixty-eight sections on four slides—,exhibited before the Society, were skilfully cut and beautifully stained and mounted.

The illustrations of his article were drawn by means of the prism, directly from his slides, and, it is hoped, give a moderately fair representation of what was there seen.

They who are acquainted with the nature of the compound eye, will understand that the parts are, in life, all in juxtaposition. And the divisions between cornea-facets and crystalline cones, between the sclæra and the nerve-rods, and between the separated layers of the retina, shown in the preparations, are occasioned by the shrinkage, due to the methods of staining and mounting.

The following extract from an article by M. A. Forel, in *Rec. Zool. Suisse*, iv. (1886) pp. 1-50, published in the *Journ. Royal Micros. Soc.*, June, 1887, p. 379, will be of interest, in connection with the article by Mr. Riederer, in this number of this Journal.

VISION OF INSECTS.—M. A. Forel gives an account of past and recent experiments on the vision of insects, and sums up the conclusions as follows:—

(1) Insects direct themselves in flight almost wholly, and on the ground partially by means of their faceted eyes. The antennæ and buccal sensory organs cannot serve for directing flight. Their extirpation makes no difference.

(2) J. Müller's mosaic theory is alone true: The retinulæ of the compound eyes do not each receive an image, but each receives a simple ray more or less distinct in origin from that of its neighbors. Gottsche's theory is false. (Müller, Grenacher, Exner.)

(3) The greater the number of facets, the more elongated the crystalline cones, the more distinct and the longer the vision. (Müller, Exner.)

(4) Insects can see particularly well the movements of bodies, and better during flight than when at rest, the image being displaced in relation to the eye (Exner). This perception of the mobility of objects diminishes as the distance increases.

(5) Contour and form are only indistinctly appreciated, and the more indistinctly the fewer the facets, the shorter the crystallines, the farther and smaller the object. Insects with big eyes with several thousand facets can see with tolerable distinctness.

(6) In flight, insects can by means of their compound eyes appreciate with accuracy the direction and distance (not too great) of objects. When at rest they can also estimate the distance of fixed objects.

(7) Certain insects (bees and humble-bees) can clearly distinguish colors, and that better than form. In others (wasps) the perception of color is very rudimentary. Ants perceive the ultra-violet rays (Lubbock).

(8) The ocelli seem to furnish only very incomplete vision, and to be simply accessory in the insects which possess also compound eyes.

PUBLICATIONS RECEIVED.

Johns Hopkins University. Studies from the Biological Laboratory : Vol. IV., No. 1 (June, 1887) ; pp. 53. Circulars : Vol. VI., No. 58 (July, 1887) ; pp. 26.

The Microscopical Bulletin and Science News : Vol. IV., No. 3 (June, 1887) ; pp. 8.

Journal of the Royal Microscopical Society : 1887, Pt. 3 (June) ; pp. 176.

The School of Mines Quarterly : Vol. VIII., No. 4 (July, 1887) ; pp. 26 + 96.

Proceedings of the American Academy of Arts and Sciences : New Ser., Vol. XIV., Whole Ser., Vol. XXII., Pt. 1 (May to December, 1886) ; pp. 269.

Bulletin of the Torrey Botanical Club : Vol. XIV., Nos. 6-7 (June-July, 1887) ; pp. 46.

The West-American Scientist : Vol. III., Whole Nos. 25-26 (May-June, 1887) ; pp. 33.

National Druggist : Vol. X., Nos. 22-25 (June, 1887), Vol. XI., Nos. 1-4 (July, 1887) ; pp. 100.

Proceedings of the Natural Science Association of Staten Island : May-June, 1887 ; pp. 3.

The Electrician and Electrical Engineer : Vol. VI., No. 66 (June, 1887) ; pp. 40.

Grevillea : No. 76 (June, 1887) ; pp. 48.

Le Moniteur du Praticien : Vol. III., Nos. 5-6 (May-June, 1887) ; pp. 64.

Jahresbericht der Naturhistorischen Gesellschaft zu Nurnberg : 1886 ; pp. 68.

Bulletin of the California Academy of Sciences : Vol. II., No. 6 (January, 1887) ; pp. 243.

The American Monthly Microscopical Journal : Vol. VIII., Nos. 6-7 (June-July, 1887) ; pp. 40.

Bulletin de la Société Belge de Microscopie : Vol. XIII., No. 7 (1886-1887) ; pp. 26.

The Botanical Gazette : Vol. XII., Nos. 6-7 (June-July, 1887) ; pp. 50.

Transactions and Annual Report of the Manchester Microscopical Society, 1886 ; pp. 36 + 91.

Monatsblätter des Wissenschaftlichen Club in Wien : Vol. VIII., No. 9 (June 15th, 1887) ; pp. 8. Ausserordentliche Beilage : No. 5 (March 7th, 1887) ; pp. 19.

The Hoosier Naturalist : Vol. II., No. 9 (April, 1887) ; pp. 16.

The Journal of the Cincinnati Society of Natural History : Vol. X., No. 2 (July, 1887) ; pp. 58.

Entomologica Americana : Vol. III., No. 4 (July, 1887) ; pp. 20.

Manitoba Historical and Scientific Society, Winnipeg. Annual Report for the year 1886-7 ; pp. 12. Transactions 22-29 (April, 1886-April, 1887) ; pp. 104.

Indiana Medical Journal : Vol. V., No. 12 (June, 1887) ; pp. 22.

The Pacific Record of Medicine and Surgery : Vol. I., No. 11 (June 15th, 1887) ; pp. 32.

The Ottawa Naturalist : Vol. I., Nos. 3-4 (June-July, 1887) ; pp. 32.

Anthony's Photographic Bulletin : Vol. XVIII., Nos. 11-14 (June-July, 1887) ; pp. 128.

Journal of Mycology : Vol. III., Nos. 6-7 (June-July, 1887) ; pp. 24.

The Hahnemannian Monthly : Vol. XXII., Nos. 5-7 (May-July, 1887) ; pp. 192.

The Microscope : Vol. VII., Nos. 6-7 (June-July, 1887) ; pp. 64.

The Naturalist : Nos. 143-144 (June-July, 1887) ; pp. 64.

Transactions of the Massachusetts Horticultural Society for the year 1886, Pt. 2 ; pp. 187.

The Canadian Record of Science : Vol. II., No. 7 (July, 1887) ; pp. 64.

The Journal of Microscopy and Natural Science : Vol. VI., Pt. 23 (July, 1887) ; pp. 64.

Nottingham Naturalists' Society. Transactions and Thirty-fourth Annual Report, 1886 ; pp. 76.

Penzance Natural History and Antiquarian Society. Report and Transactions, 1886-87 ; pp. 84.

Bulletin de l' Académie d' Hippone No. 22 (1887), Fasc. 1 ; pp. 176.

Biological Instruction in Universities ; pp. 13. By C. O. Whitman.

Bulletin of the American Museum of Natural History : Vol. II., No. 1 (May, 1887) ; pp. 39.

Smithsonian Institution. Annual Report of the Board of Regents to July, 1885, Pt. 1 ; pp. 996.

The Microscopical Bulletin and Science News: Vol. IV., No. 4 (August, 1887); pp. 8.

Bulletin de la Société Royale de Botanique de Belgique: Vol. XXVI. (1887); pp. 241.

Bulletin de la Société Belge de Microscopie: Vol. XIII., No. 8 (1886-1887); pp. 18.

The Naturalist's Monthly: Vol. I., No. 1 (September, 1887); pp. 20.

Journal of the Royal Microscopical Society: 1887, Pt. 4 (August); pp. 164.

Memoires de la Société des Naturalistes de Kiew: Vol. VIII., No. 2 (1887); pp. XC. + 258.

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